

# Gulf Coast Aerosol Research and Characterization Program (Houston Supersite)

## PROGRESS REPORT

EPA Contract No. R-82806201  
between the Environmental Protection Agency and the  
University of Texas at Austin

Submitted by:

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**EPA Agreement No.:** R-82806201

**Title:** Gulf Coast Aerosol Research and Characterization Study

**Investigators:** Dr. David Allen (PI) and Dr. Matthew Fraser (Co-PI)

**Institutions:** University of Texas and Rice University

**Research Category:** Air Quality/Fine Particulate Matter

**Project Period:** 01/15/00-11/30/03

**Objective of Research:** Characterize fine particulate matter and fine particulate matter formation processes in Southeast Texas

**Progress Summary/Accomplishments:**

During the past quarter, sampling was initiated at the Houston Supersite, and the intensive sampling period was completed. While quality assured data are not yet available, it is already clear that the intensive sampling period was very successful. All of the investigators associated with the Supersite were able to deploy and operate their instruments. The program was successful in attracting the participation of approximately 300 research scientists, ensuring that the data collected through the Supersite will result in a comprehensive dataset suitable for rigorously testing air quality models. The period of sampling successfully captured multiple episodes of high ozone and high particulate matter concentrations, representative of a range of meteorological conditions.

Brief summaries of the final site logistics, the intensive sampling period, ongoing sampling, quality assurance, dataset development, data analysis plans, and budget status are provided below. More detailed descriptions of each of these topics is provided in the following sections.

1. *Site Logistics* Supersite sampling is currently being conducted at three locations. One site is most strongly influenced by Galveston Bay breezes; a second site is in the heart of the heavily industrialized Ship Channel and the third site is influenced most strongly by urban emissions. All sites are currently operating and are equipped with trailers, power, phones, and sampling towers. The perimeter of each site is secured by fencing.
2. *Ongoing sampling* During the previous quarter, a month-long intensive sampling program was conducted. Approximately 300 scientists participated in the intensive, making it one of the largest air quality field programs ever performed. Among the participating organizations were the Department of Energy (Atmospheric Chemistry Program), the National Oceanographic and Atmospheric Administration, the Texas Natural Resource Conservation Commission (TNRCC), and the Houston Regional Monitoring Network. Several Environmental Protection Agency scientists participated in the intensive through Intergovernmental Personnel Agreements arranged through the University of Texas and funded by the TNRCC. It is beyond the scope of this quarterly report to describe all of the measurements that were undertaken, but more details are available at the study web site ([www.utexas.edu/research/ceer/texaqs](http://www.utexas.edu/research/ceer/texaqs)). Although the intensive sampling period is now

over, a group of core measurements, suitable for use in source resolution and health effects studies, are continuing.

3. *Quality Assurance* The Quality Assurance Project Plan has been approved and is being used to guide other Supersites in their QAPP development. In addition, a novel method for challenging aerosol instruments was tested during the intensive sampling period.
4. *Dataset development* Plans for Supersite data management have been coordinated with NARSTO and with the data management teams at the other Supersites. We anticipate that the dataset will be populated beginning in the first quarter of 2001.
5. *Data analysis plans* While some data are still being collected and many of the participants in the intensive sampling period are still performing preliminary analyses of their data, planning has begun for a series of 3 data workshops.
6. *Budget status:* The total project spending remains on target, however, adjustments among budget categories and between project periods will be required.

More detailed lists of accomplishments in each of these areas are attached. Further details can be found at the study web site ([www.utexas.edu/research/ceer/texaqs](http://www.utexas.edu/research/ceer/texaqs))

## *Site Logistics*

Supersite sampling is currently being conducted at three locations. The locations of the sites are shown in the map below.



One site (Deer Park) is located in a region that is influenced by breezes from Galveston Bay and is generally upwind of the heavily industrialized area (the Houston Ship Channel). In order to accommodate the large number of investigators during the August and September intensive, this site was temporarily moved to a the LaPorte Airport, which is a few kilometers east of Deer Park. One of the towers at the LaPorte site is shown below. During the intensive, the LaPorte site was equipped with approximately 15 trailers, two towers, and multiple storage units.



The second of the three Supersite sampling locations is in the heart of the industrialized Ship Channel. This site is owned by the Houston Regional Monitoring Network (HRM Site 3 or HRM3), an industrial consortium that funds air quality monitoring in the Houston area. Sampling of fine particulate mass concentrations in 1997 and 1998 indicated that this site is likely to see the highest PM concentrations in the Houston area. As shown in the photo below, the site is located in the vicinity of a number of emission sources, but this type of source dominated location is typical of a 500 km<sup>2</sup> region in Houston.



The final site is located at Aldine, in a primarily low-income residential area. This site is most strongly influenced by emissions from the urban areas in Houston.

All three sites are equipped with trailers, power, phones, and sampling towers. The perimeter of each site is secured by fencing.

## *Ongoing Sampling*

During the previous quarter, a month-long intensive sampling program was conducted. Approximately 300 scientists participated in the intensive, making it one of the largest air quality field programs ever performed. Among the participating organizations were the Department of Energy (Atmospheric Chemistry Program), the National Oceanographic and Atmospheric Administration, the Texas Natural Resource Conservation Commission (TNRCC), and the Houston Regional Monitoring Network. Several Environmental Protection Agency scientists participated in the intensive through Intergovernmental Personnel Agreements arranged through the University of Texas and funded by the TNRCC. It is beyond the scope of this quarterly report to describe all of the measurements that were undertaken, however, a sense of the spatial scope of the measurements is given by the map in the previous section. Each of the locations identified in the map is a study site. There were 5 major ground chemistry sites, and approximately twenty peripheral sites. Each of the ground sites had a standard group of measurements that were performed, and the Supersite funded advanced aerosol measurements at the three sites noted in the previous section. Details of the equipment deployment at the sites are provided at the study web site ([www.utexas.edu/research/ceer/texaqs](http://www.utexas.edu/research/ceer/texaqs)) and in the final Supersite proposal.

Significantly, wind speeds and directions aloft were measured at more than 5 sites. The sites will characterize the complex land-bay breeze flow patterns. Again, the details of the equipment deployment at the sites are provided at the study web site ([www.utexas.edu/research/ceer/texaqs](http://www.utexas.edu/research/ceer/texaqs)). This rich meteorological data set will make the Houston Supersite dataset particularly valuable for testing air quality models for fine particulate matter formation and transport.

Five aircraft were used to complement the ground network. The aircraft were provided by NOAA (2), the Department of Energy, NASA, and Baylor University (funded by the TNRCC). Again, the details of the instrumentation on the aircraft, as well as preliminary flight data, are provided at the study web site ([www.utexas.edu/research/ceer/texaqs](http://www.utexas.edu/research/ceer/texaqs)).

The intensive sampling period is now over, but a group of core measurements, suitable for use in source resolution and health effects studies, are continuing at the Deer Park site, HRM3 and Aldine. These core measurements include FRM particulate mass, near real time measurements of particulate sulfate, nitrate and carbon, near real time measurements of aerosol size distributions, and a variety of gas phase measurements.

## *Quality Assurance*

The Quality Assurance Project Plan has been approved and is being used to guide other Supersites in their QAPP development.

One of the challenges in developing a QAPP for the Supersites is the lack of standards against which to test the performance of aerosol instruments. During the intensive sampling period, a group from Brookhaven National Laboratory (part of the DoE's Atmospheric Chemistry Program) deployed a novel method for challenging aerosol instruments. This system, which will be described in more detail in subsequent reports, generated aerosol of known composition (mixtures of ammonium sulfate and succinic acid) and of calibrated size (size cuts created using a differential mobility analyzer). Particle counters provided a rough indication of the mass loading. This model aerosol was delivered to the inlets of many of the aerosol instruments deployed during the intensive. The advantage of this method is that it provides a sample with reproducible size and composition, facilitating intercomparison of instruments. While improvements can undoubtedly be made, the measurements represent a first step in ensuring the comparability of measurements made at multiple sites, by multiple investigators with different instrument designs.

## *Dataset development*

Based on discussions with NARSTO, the EPA and data management coordinators at the other Supersites, draft data formatting protocols have been defined and circulated to all Supersites. Elena McDonald-Buller, the Data Management Coordinator for the Houston Supersite, and Sigurd Christensen of the NARSTO Quality Systems Science Center continue to have regularly scheduled conference calls with the Supersite Data Management Coordinators to discuss issues regarding data management and submission of data to the Permanent Data Archive. We anticipate that the conventions for the dataset will be finalized in the coming quarter and that the dataset will be populated beginning in the first quarter of 2001.

## *Data analysis plans*

While some data are still being collected and many of the participants in the intensive sampling period are still performing preliminary analyses of their data, planning has begun for a series of 3 data workshops. The first workshop will occur in early to mid-January and will focus on preliminary reports of data collected during the intensive sampling period. NOAA has offered to host the meeting in Boulder and, because of the preliminary nature of the data reports, attendance will be restricted to study participants and funding organizations.

A second meeting will be held in Texas (either Houston or Austin in the spring March or April) and will focus on reports of data being submitted to the data archive. Attendance at this meeting will likely again be restricted to study participants and funding organizations.

A third meeting will be held in the late summer and will be open to the entire research community. This meeting will focus on reports of collaborative research between investigators and descriptions of the data archive.

Finally, many of the study participants anticipate presenting the results of their work at the December, 2001 meeting of the American Geophysical Union in San Francisco.

### *Budget status*

The total project spending remains on target, however, adjustments among budget categories and between project periods will be required.

One set of adjustments that will be required, between budget categories, was caused by site preparation costs that were significantly larger than anticipated. To accommodate the large number of participants, existing TNRCC and HRM sites had to be expanded, while the original budget had anticipated using existing site footprints and power. Much of the additional cost, however, will be offset by the Texas Natural Resource Conservation Commission's agreement to provide VOC monitoring that had originally been part of the Supersite budget. When all of the site preparation costs have been finalized, a budget revision request will be submitted.

A second set of adjustments, transferring funds from Year 2 to Year 1, may be necessary. This transfer may be needed because of a delay in receiving \$200,000 in data archiving funds appropriated by the TNRCC. Some of the funds have arrived at the University of Texas, and to the extent possible, portions of Year 1 costs associated with data base development that have been charged to the Supersite will be charged to the newly arrived TNRCC funds. Due to problems with carry-overs between fiscal years, however, it may be necessary to transfer some database development funds from Year 2 in the Supersite project to Year 1. When these issues have been clarified, a budget revision request will be submitted.